

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Text to accompany:

Open File Report 78-631

1978

COAL RESOURCE OCCURRENCE MAP AND
COAL DEVELOPMENT POTENTIAL OF THE
IRON SPRING QUADRANGLE,
BIG HORN AND TREASURE COUNTIES, MONTANA

[Report includes 3 plates]

By

Colorado School of Mines Research Institute

This report has not been edited for
conformity with U. S. Geological Survey
editorial standards or stratigraphic
nomenclature.

CONTENTS

| | Page |
|-----------------------|------|
| Introduction ----- | 1 |
| Purpose ----- | 1 |
| Location ----- | 1 |
| Accessibility ----- | 1 |
| Physiography ----- | 2 |
| Climate ----- | 2 |
| Land status ----- | 3 |
| General geology ----- | 3 |
| Previous work ----- | 3 |
| Stratigraphy ----- | 3 |
| Structure ----- | 4 |
| Coal geology ----- | 4 |
| References ----- | 6 |

ILLUSTRATIONS

[Plates are in pocket]

Plates 1-3. Coal resource occurrence maps:

1. Coal data map
2. Boundary and coal data map
3. Coal data sheet

Conversion table

| <u>To convert</u> | <u>Multiply by</u> | <u>To obtain</u> |
|--------------------|--------------------|------------------------------------|
| feet | 0.3048 | meters (m) |
| miles | 1.609 | kilometers (km) |
| acres | 0.40469 | hectares (ha) |
| tons (short) | 0.907 | metric tons (t) |
| short tons/acre-ft | 7.36 | metric tons/hectare-meter (t/ha-m) |
| Btu/lb | 2.326 | kilojoules/kilogram (kJ/kg) |

INTRODUCTION

Purpose

This text is to be used in conjunction with the Coal Resource Occurrence (CRO) maps of the Iron Spring quadrangle, Big Horn and Treasure Counties, Montana (3 plates; U.S. Geological Survey Open-File Report 78-631). This report was compiled to support the land planning work of the Bureau of Land Management in response to the Federal Coal Leasing Amendments Act of 1975, and to provide a systematic resource inventory of Federal coal lands in Known Recoverable Coal Resource Areas (KRCRAs) in the western United States.

Location

The Iron Spring 7 1/2-minute quadrangle is in northeastern Big Horn and southern Treasure Counties, Montana, about 15 miles (24 km) southeast of the town of Bighorn and 21 miles (34 km) northeast of Hardin, Montana.

Accessibility

The Iron Spring quadrangle area is accessible from Hardin by going 2 miles (3.2 km) east on Interstate Highway 90, then east-northeast on local route 384 (Sarpy Road) 24 miles (38 km). Sarpy Road runs north-south along the eastern side of the quadrangle, and unimproved roads cross the remainder.

A branch line of the Burlington Northern Railroad crosses the eastern side of the quadrangle parallel with Sarpy Road, and runs south to the Absaloka (Sarpy Creek) Coal Mine in the Wolf School quadrangle.

Physiography

Steepest relief and highest elevations are found in the south-central part of the quadrangle in the Red Hills. This area is characterized by steep headward reaches of numerous drainages, and well-defined divides. Maximum local topographic relief is about 300 feet (91 m); elevations range from 3,400 feet (1,036 m) to 3,708 feet (1,130 m).

The remainder of the quadrangle is of moderate relief, with local watersheds and divides. Elevations range from 3,000 feet (914 m) in the extreme northeast, to a high of 3,708 feet (1,130 m) in the Red Hills.

Sarpy Creek is the major stream in the area. It drains to the north along the eastern edge of the quadrangle. All the streams are ephemeral, and there are small ponds throughout the quadrangle.

Climate

Regional climate is semiarid and is characterized by pronounced variations in seasonal precipitation and temperature. Annual precipitation varies from less than 12 inches (30 cm) to about 16 inches (41 cm) a year, depending on the location and the altitude. The greatest amount of precipitation occurs at the higher altitudes on the divides between the major drainages. The heaviest precipitation occurs from April to August. The largest average monthly precipitation is during June. The highest temperatures, as much as 110°F (43°C), occur in July and the lowest, as low as -50°F (-46°C), in January and February; the annual mean temperature is about 45°F (7°C) (Matson and Blumer, 1973, p. 6).

Land status

The quadrangle is located in the extreme northwestern part of the Northern Powder River Basin KRCRA. The Federal Government does not own any coal rights in this quadrangle because all Federal land and minerals were ceded to the Crow Indians in 1958.

GENERAL GEOLOGY

Previous work

The southern two-thirds of the quadrangle, encompassing T. 2 N., R. 36 E., and T. 2 N., R. 37 E., was mapped by W. T. Thom, Jr. and others (1935, pl. 1).

Stratigraphy

A generalized columnar section of the coal-bearing rocks is shown on the Coal Data Sheet (pl. 3) of the CRO maps. The exposed bedrock units belong to the Fort Union Formation (Paleocene) which is composed of three members: the upper Tongue River Member, the middle Lebo Shale Member, and the lower Tullock Member. Rogers and Lee (1923, p. 29) represented the Tullock to be a member of the Lance Formation, but since 1949 the U.S. Geological Survey has considered the Tullock in Montana to be the lowest member of the Fort Union Formation.

The Tullock crops out near the bottoms of Sarpy Creek and its tributaries in the northeast quarter of the quadrangle. It is composed of yellowish sandstone and shale (Rogers and Lee, 1923, p. 29), and contains a thin, unimportant coal bed.

The Lebo Shale Member crops out throughout the remainder of the quadrangle except the south half of the southwest quarter, which is occupied by the Tongue River Member. The Lebo Shale Member consists of dark gray, olive gray, and drab shale interbedded with a few beds of gray or yellow sandstone (Rogers and Lee, 1923, p. 35), and contains no coal beds of consequence.

The Tongue River Member crops out near the south border of the southwest quarter of the quadrangle, and consists of light-colored sandstone and sandy shale. It contains important coal beds. The member is at least 1,275 feet (389 m) thick where more completely exposed in the Little Wolf Mountains east of the Iron Spring quadrangle (Rogers and Lee, 1923, p. 41), but much of the member in the quadrangle has been removed by erosion so that a maximum of about 300 feet (91 m) remains.

Structure

Strata in the south-central portion of the quadrangle where coal beds have been mapped are essentially flat-lying. Two short northeastward-trending faults of minor displacement were mapped by Thom, Jr. and others (1935, pl. 1).

COAL GEOLOGY

Three coal beds, all in the Tongue River Member, are mapped on the surface in this quadrangle (pl. 1) or are shown in section on plate 3. Two may be sufficiently thick to contain reserves.

The stratigraphically lowest of the three is the Robinson coal bed, which lies about 100 feet (30.5 m) above the base of the Tongue River Member.

Above the Robinson is a noncoal interval of 30 feet (9 m), a local bed which may be equivalent to the Stocker Creek coal bed, a noncoal interval of 60 feet (18 m), and the Rosebud coal bed.

The coal beds crop out in a small area near the south border of the southwest quarter of the quadrangle (pl. 1). The Robinson coal bed measures as much as 7.2 feet (2.2 m) thick and the Rosebud coal bed as much as 5.2 feet (1.6 m) thick on outcrops. The true thicknesses of both the coal beds may be much more than these measurements indicate because large areas of the coal have burned to clinker.

The entire quadrangle lies within the Crow Indian ceded area. There are no Federal coal lands. Most of the lands belong to the Crow Indian Tribe or to individuals. For this reason no CRO maps were made for individual coal beds, and no coal resource tonnages were estimated. No CDP (Coal Development Potential) maps for surface or underground mining were made.

REFERENCES

- Matson, R. E., and Blumer, J. W., 1973, Quality and reserves of strip-pable coal, selected deposits, southeastern Montana: Montana Bureau of Mines and Geology Bulletin 91, 135 p.
- Rogers, G. S., and Lee, Wallace, 1923, Geology of the Tullock Creek coal field, Rosebud and Big Horn Counties, Montana: U.S. Geological Survey Bulletin 749, 181 p.
- Thom, W. T., Jr., Hall, G. M., Wegemann, C. H., and Moulton, G. F., 1935, Geology of Big Horn County and the Crow Indian Reservation, Montana, with specific reference to the water, coal, oil, and gas resources: U.S. Geological Survey Bulletin 856, 200 p.
- Tudor, M. S., 1975, Geological exploration and development of coal in the Sarpy Creek area, Big Horn County, Montana: Montana Geological Society 22nd Annual Publication, Energy Resources of Montana, p. 159-164.